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HYDRAULIC LIFTS, PAST AND PRESENT, AND A NEW METHOD FOR THEIR BALANCING

JOHN F. RODDINE, '03

ALUMNI NOTES
ROSE LEAVES
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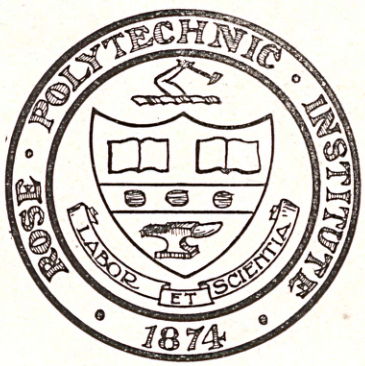

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The eighth national convention of the Inter-Collegiate Prohibition Association, to be held at Des Moines, Iowa, January 5, has for its purpose the working out, among other things, of "plans for the extension of the college prohibition movement to all other lands." The association, like the farmer in the fable, has let its ambition carry it away.

A farmer in a village store made the assertion that he could "lick any man in the house." A fight followed and the farmer was declared victorious. He then declared that he could "lick" any man in the village, and he was again the victor. His elation got the better of him and he decided to go after big game. He issued a challenge to any man in the county. After a time the challenge was accepted. In the ensuing fight, the farmer was decisively beaten. When he became able to see visitors, one of his friends said to him, "John, you were a good man, but you included too much territory." It is our opinion that the Association purposes to include too much territory.

Regardless of what the respective merits of wet or dry conditions in this country may be, and regardless of the liquor situation in foreign countries, the logical political field for American colleges is in America. We would resent the intrusion of foreign uplifters into our affairs as an insinuation that we did not know what was good for us, or knowing, that we lacked the will or ability to work out our own salvation. We can hardly expect other nations to feel differently toward American uplifters.

No one can doubt that the people taking part in the world-wide prohibition movement are sincere in their efforts to benefit mankind but their energies are being misdirected. There are numberless problems to be faced right here in the United States; problems which are far more important to us, as a nation or as individuals, than the liquor question in all the other lands combined.

To cite only one opportunity for achievement, the government has asked for cooperation in its war on venereal diseases; if the efforts which are to be used abroad were turned to this most important work here at home they would not only be put to a much better purpose but they would meet with general approval. There is no end to the good which might come from efforts proper-

ly directed, and the choice of fields in the United States is almost unlimited. American colleges and Americans generally will do well to keep American politics in America.

The pep shown in the inter-class basket ball games has been most gratifying. Each class has taken a decided interest in its team and each class team has been superior to those of former years. The pride that the classes have taken in their teams is a good indication that the varsity quintet will get the support that it deserves.

The games have shown that we still have claims on the old title of "Fighting Engineers." No team was beaten until the game had gone over time. There was never a let-up in the playing; every man fought to the end. That is the kind of spirit that wins and that is the kind of spirit that we are going to keep thruout the season.

The squad practices long and hard and the least we can do is to go out and help them win. You should either be hoarse or ashamed of yourself at the end of every game.

We have plenty of good material, a good coach, and we have started with a punch. Surely a winning combination. Altogether now—let's go!

The Alumni contributor to this issue is J. F. Robbins, '08, until recently a lieutenant in the navy. Altho the article has already appeared in Mechanical Engineering, we believe that it will prove interesting to a large number of our readers. "Mechanical Lifts, Past and Present, and a New Method for Their Balancing," is written in a clear and direct style and it will prove as interesting to the casual reader as it will to the mechanical engineer.

We are indebted to Mechanical Engineering for the use of cuts and illustrations and for permission to reprint the article.

The miner's strike holds our attention and gives us much to cuss about. The H. C. L. gets more than mention and causes us to go without a lot of things we think essential—silk sox and shirts and picture shows; it makes our purse a Differential and makes our share of grief and woes so hard to bear we often think we'll end our misery in the "drink."

In times gone by, when we felt blue, we had at hand alleviation but now there's nothing left to do, when we're in need of consolation, but drink the stuff of rain and snow; the stuff we use for driving trains—loathsome, insipid, H_2O,—it is no antidote for pains. It seems to us that war comes high if we must pay with gin and rye.

The weather-man don't try to please, nor does the Fuel Administration; they tell us we may stay and freeze or go to—well, on a vacation. We've been denuded of our dollars while our debts accumulate, we're down so low that rubber collars can no more humiliate than we can buy a stein of "bock" or get our rain-coat out of hock.

In spite of all our many troubles, December twenty-fifth is near. We'd like to crab but, just like bubbles, our worries burst and disappear. Altho our toddy lacks its whisky—we recall it with a sob—the whole blamed world is feeling frisky and we're out to join the mob. Tho our creditors are yelling and we see the jail door yawn, we'll be satisfied to worry after Christmas Day has gone.

Hydraulic Lifts, Past and Present, and a New Method for their Balancing.

By Lieut. J. F. Robbins, U.S.N.R.F.,

Reprinted from Mechanical Engineering.

Many types of mechanical lifts or elevators for lifting vessels over elevations have been proposed and built in the course of the development of waterways. However, the original principle involved in the masonry lock invented by Leonardo da Vinci still holds its superiority, mainly because efforts to develop mechanical lifts have failed to keep pace with the increasing size of vessels to be transported.

The inclined railway for hauling the load up and over elevations by cable served its purpose, to a certain extent, in the early days of canal development, but had its apparent limitations.

A gated tank on wheels was built in 1874 on the Chesapeake and Ohio Canal, to be hauled up an incline by means of cables with counterweights, but failed in its practical application.

In the same year, 1874, Edwin Clark, an English engineer, invented and built the first balanced hydraulic-lift lock. This structure, built at Anderton, England, provided means for transferring vessels between levels of the canal on single-plunger lifts.

Clark and his associates later built balanced lifts at La Louviere, Belgium, and Les Fontinettes, France, having a lift of 50 ft., the lock chambers being 140 ft. long and 19 ft. wide, with a navigable depth of 7 ft. 10 in. He also proposed to use this principle for transferring trains of freight cars between different levels, but did not put the idea into practical use.

In Germany much work has been done in developing mechanical-lift locks. Hoffman, a German engineer, invented and built a floating lock supported on tanks; and later, in the Dortmund and Ems Canal, locks were built on this principle having a lift 68.5 ft. The lock chamber was built in the shape of a box with end gates, 229.6 ft. long, 28.2 ft. wide and 8.2 ft. deep, supported on five steel cylinders or tanks. The weight of the structure and water load was supported by the buoyancy of these tanks which floated in wells 30.17 ft. in diameter. The lift is made in approximately 15 min. by four large screws operated by 150-hp. motors. This installation, while larger than any mechanical lift previously built, fails to take advantage of the counterbalancing effect that obtains in the balanced lifts built by Clark. This necessitates a considerable expenditure of energy in overcoming the attraction of gravity, which is, of course, unnecessary in any form of balanced lift.

In Austria an international competition for a canal life was authorized for the Danube-Oder Canal. The difference in elevation to be overcome was 62.5 ft. and the lock was to be 229.6 ft. long, 28.2 ft. wide and 8.2 ft. deep. The competition, which closed in 1904, awarded the first prize of 100,000 kronen to a design involving the old principle of the inclined plane. The design awarded

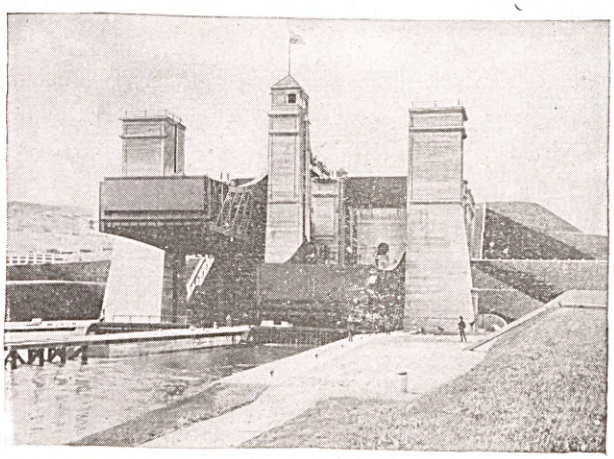


FIG. 1. PETERBOROUGH HYDRAULIC-LIFT LOCK, TRENT CANAL

the second prize was unique, at least, in proposing a revolving elevator. The scheme called for a floating structure about 175 ft.

in diameter and 230 ft. long, with a pair of swinging boxes somewhat similar to a Ferris wheel. With the elevator built lengthwise in the canal, it was proposed to float a boat into the upper or lower box through end gates, and by rotating the wheel transfer the vessel from one level to another.

The firm of Hoppe in Berlin has made a study of the application of a multiple of hydraulic plungers for operating large lifts, but found an insurmountable difficulty in maintaining the perfectly uniform and synchronous movement of a number of plungers which is absolutely necessary when handling loads greater than can be carried on one plunger.

The largest and most successful example of the application of the balanced hydraulic lift was built in 1905 in Canada in the Trent Canal at Peterborough. This lock, shown in Fig. 1, together with the similar one at Kirkfield on the Trent Canal, has been in successful operation since put into commission and has various economic advantages over the masonry type of lock. The total lift of 65 ft.—over twice the height of the lift of the Panama Canal locks—has been made in the record time of 6½ min., the average time necessary to pass a vessel being from 10 to 12 min. Since only a comparatively small amount of water is used in making a lockage, most of the normal flow through the canal is available for water power, some of which is used for operating auxiliary pumps and lighting.

The lock at Peterborough consists of two steel boxes 140 ft. long, 33 ft. wide and carrying 10 ft. of water, each supported on its centrally located plunger 7½ ft. in diameter with a 65-ft. stroke. See Fig. 2. The cylinders or presses into which the plungers extend are connected by a 12-in. pipe with a gate valve, so that with one box with its water load at the upper level and the other at the lower level of the canal, by opening the valve in the cross-connection the position of the lock chambers is changed and the lockage made.

The stroke of the plungers has been set so that the box at the upper level stops with the water level in the box about four inches

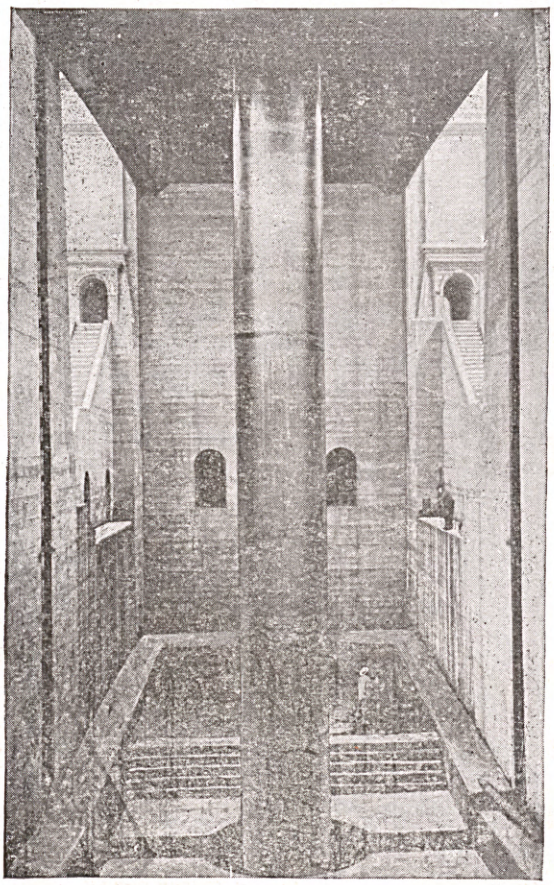


FIG. 2. ONE OF THE PLUNGERS OF THE PETERBOROUGH LOCK

below the water level in the canal, and takes on this additional water load. This excess load, amounting to about 50 tons, when taken into the upper lock acts as a surcharge to overcome friction and gravity and bring the upper lock down and the lower one up.

When it is desired to transfer a boat from one level to the other, the boxes being in their respective positions at the end of the stroke of the plunger, the clearance between the end of the box and canal is first closed by

inflating an air hose laid down the side walls and across the sill. Then this clearance space is filled through wicket gates in the end gates of the lock and canal. The clearance space having been filled and water levels in canal and lock having been equalized, the end gates, which are hinged across the sill of lock and canal, are folded down, making a continuous stretch of water from the canal to lock. Then the vessel is moved into the lock, displacing its own weight of water, of course, so that the load is constant, regardless of the size of the vessel. After the entrance of a vessel into one or both of the locks the end gates are closed, the clearance space emptied, and the cross-connection valve gradually opened, allowing the upper box to come down and forcing the lower one up.

While this installation of balanced lifts has proved to be economical in first cost, operation, time and quantity of water required to make a lockage, the locks are not large enough to accommodate vessels or cargo barges of very great capacity.

It was found, however, that the size and load to be handled were about as extensive as could be supported on the cantilever structure of the box over one plunger. Also, the total weight of one lock chamber, plunger and water load, which is in the neighborhood of 1900 tons, was about the maximum that could be safely supported on the masonry foundation for the cylinder castings.

For these reasons, and because no scheme has been found for safely supporting the load on more than one plunger, no balanced lift has ever been built of greater size than the one at Peterborough.

A vertical-lift lock was proposed for the Erie Canal at Lockport, N. Y., where a single mechanical lift was to take the place of a double flight of masonry locks there used to overcome an abrupt change in elevation of 56 ft. The design called for a steel box 225 ft. long, 29 ft. wide and 9 ft. deep, which was to be supported by 88 link-and-pin

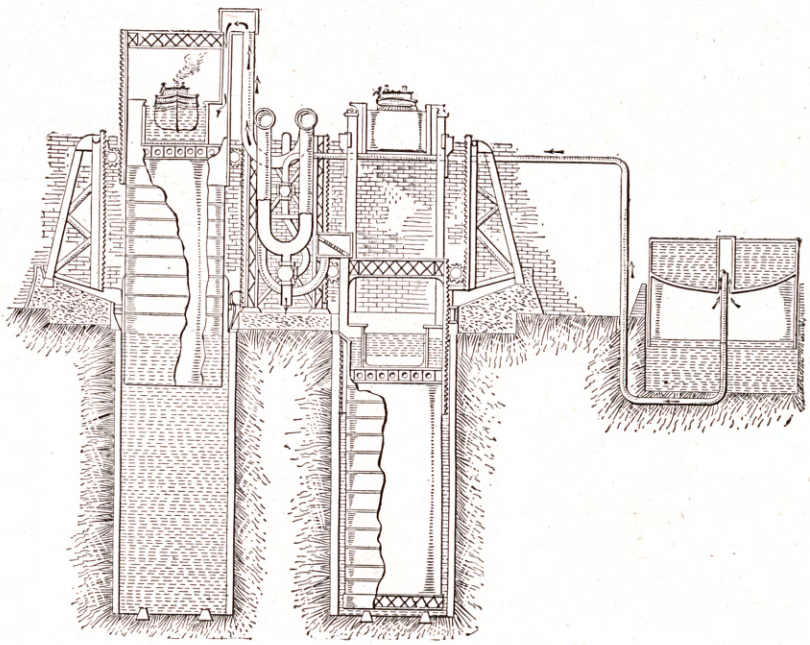


FIG. 3. AIR-SUPPORTED LIFT LOCK PROPOSED FOR N. Y. STATE BARGE CANAL

chain cables attached to floor beams and running up and over sheave pulleys and down to 1000 tons of cast-iron counterweights. The sheave pulleys were to be carried by steel shafts supported, one on each side, in the permanent structure built at each side of the canal. The movement of the load was to be controlled by a number of brakes on the shafts.

At Cohoes, on the New York State Barge Canal, the installation of a mechanical-lift lock was seriously considered, and a board of engineers investigated and reported on three different designs. Here, in the place of 16 masonry locks, it was proposed to install a pair of balanced lifts to overcome an elevation of about 120 ft. The specifications called for two counterbalancing tanks 310 ft. long, 28 ft. wide and 12 ft. deep, each capable of floating two vessels of 1000 tons capacity. The three designs considered proposed to make use of three different supporting mediums: air, sets of cables, and hydraulically operated plungers.

Air-Supported Lifts. In the pneumatic design the weight of the steel box, or lock and water load, was to be directly supported on the elastic cushion of air maintained under the load by having the steel sides of the box extend downward below the surface of water inside a large rectangular caisson built in the canal. See Fig. 3.

The two similar structures, either in tandem or parallel, were to have the air space under each box connected by huge air mains 21 ft. in diameter, with the necessary return bends and valves for shifting the supporting air from the space below one lock to the other when the locks were to be shifted between levels.

This scheme would necessitate an excavation or pit somewhat larger than the area of the lock and somewhat deeper below the level of the canal than the height of the lift, or 120 ft. Built into the retaining walls of this pit were to be steel side walls to act as guides for the moving structure and to carry apparatus for maintaining the lock on an even keel.

A feature necessary to the successful operation of such a structure is some method of counteracting the action of excess loads at one end brought about by the banking up of water due to the wind or the entrance of a vessel.

The method proposed for preventing any such tipping action was to install a shaft running the full length of the lock on each side between the box and the side walls, the shafts to be equipped with gears which were to mesh with stationary racks attached to the lock structure and the side walls. Since the ability of such a device to overcome the tipping forces would depend on the torsional strength of a shaft some 310 ft. long, it is improbable that it could perform its functions successfully without an excessively large shaft being used.

Cable-Supported Lifts. The second design considered by the board of engineers covered a pair of steel boxes of the specified dimensions supported by numerous cables running over sheave pulleys on the permanent structure from one box to the other, each load thus counterweighting the other and being shifted from one elevation to another by a surcharge of water in the upper box.

Plunger-Supported Lifts. The third proposal covered a pair of steel boxes working up and down in balance with each other and supported on three steel plungers under each load. The cylinders were to be connected by piping with suitable valves so that when the upper lock came down the lower lock would be forced up, registering with the upper level of the canal. As in the pneumatic scheme, it was recognized that some device for maintaining the level of the box would be necessary. In this case the movement of the three plungers was to be co-ordinated by a central counterweight directly connected with both ends of the tank "in such a manner that the

weight would always act to overcome the effect of an unbalanced load."

In this, as well as in the second proposal, the equilibrium of the structure and the water load was to depend on the operation of a mechanical device, the positive action of which would be questionable for maintaining the level of an unstable water load. The report of the board of engineers shows considerable interest in the future possibilities of the hydraulic-plunger lift, but recommended four masonry locks with a lift of 28 ft. each.

An interesting design for a balanced-lift lock has been described by Dr. J. A. L. Waddell, in connection with the proposed Lake Erie and Ontario Sanitary Canal and power project. See Fif 4. Here, in order to make available for power purposes the water which would be used for lockage in the masonry type of lock, it is proposed to install two pairs of balanced lifts, one of 208 ft. and one of 104 ft. lift. The lifts, as described, are to be supported by cables connecting the inboard sides of the two parallel boxes and running over fifty-six 20-ft.-diameter sheave pulleys mounted on the retaining wall between the boxes. The outboard edge of each box is connected by a similar set of cables running over pulleys and to counterweights suspended outside the two outer retaining walls.

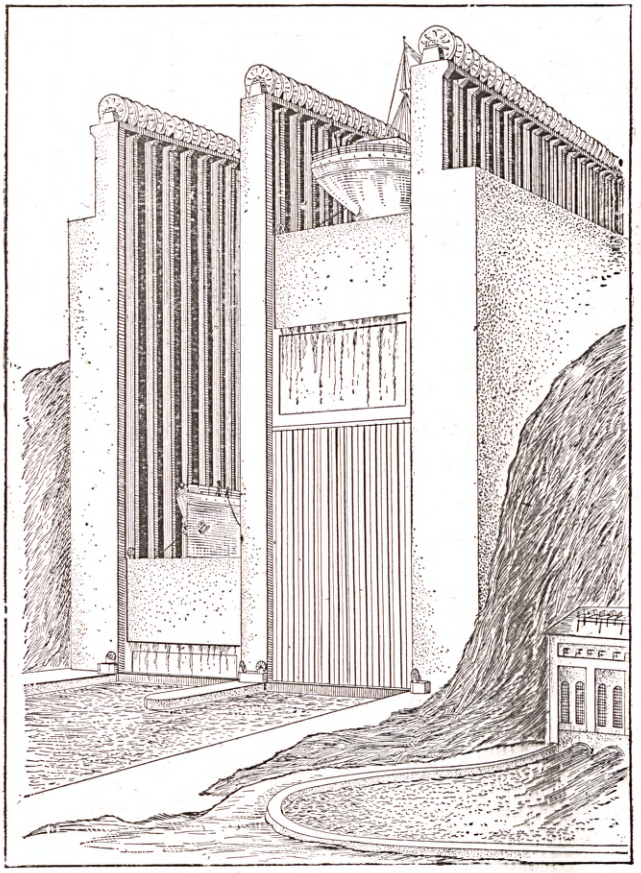


FIG. 4. CABLE-SUPPORTED LIFT LOCK PROPOSED FOR LAKE ERIE AND ONTARIO SANITARY CANAL

This design, adopted as the most feasible known method of overcoming the high lift with locks of large size, is somewhat similar to that which was proposed for the New York State Barge Canal. It is believed that there would be considerable difficulty in maintaining the equilibrium of these lock chambers, which are to be 660 ft. long, 70 ft. wide, and carrying 30 ft. of water; and that some extensive braking apparatus would be necessary on the sheaves or supporting shafts. Any excess load on one end of one lock, tending to force it down, would lift the same end of the other up and would be cumulative in effect with the water load.

As has been well said by the inventor of one of the many designs of balanced lifts, "No mechanic has yet put into successful operation an apparatus in which a number of hydraulic plungers are so controlled and synchronized as to move at equal speed, as they must in operating a lock chamber."

This difficulty of synchronizing the movement of a number of supporting plungers has stood in the way not only of the development of hydraulic lifts of a size sufficient to meet the demands of modern canals, but also has prevented the use of balanced lifts in other applications where their use might be the means of solving urgent economic problems.

Through many years of study of this problem no feasible scheme has been proposed up to the discovery of the simple method of interconnecting systems of balancing plungers, or cables, as hereinafter presented.

This scheme virtually does away with all limitations as far as size of the lift and load to be handled is concerned. The accompanying diagram, Fig. 5, illustrates this principle of interconnecting the points of support of each load. As indicated in the figure, each lift is supported by a group of four plungers

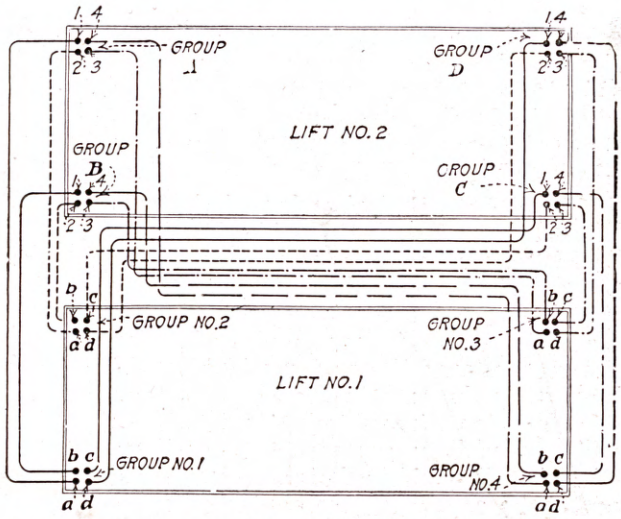
(or cables) at each corner. The plungers **a, b, c** and **d** in group No. 1 of lift No. 1 are hydraulically connected with plunger No. 1 of groups A, B, C and D of lift No. 2; plungers in group No. 2 of lift No. 1 are connected with plunger No. 2 of groups A, B, C and D of lift No. 2; plungers in group No. 3 of lift No. 1 are connected with plunger No. 3 in groups A, B, C and D of lift No. 2; plungers of group No. 4 of lift No. 1 are connected with plunger No. 4 of groups A, B, C and D of lift No. 2. Conversely, from lift No. 2, each plunger of groups A, B, C and D is connected to a similar plunger in groups Nos. 1, 2, 3 and 4 of lift No. 1. Thus the plungers of each group of one lift are hydraulically connected with the four corners of the other lift, so that the pressure due to one load is uniformly distributed to the other.

A simple illustration of a cable-supported lift of this type is shown in Model No. 1, Fig. 6, in which two shelves are supported by 16 cords. In this model four cords are write, four are red, four are brown and four are blue and white twisted. In the figure the red and brown cords cannot be distinguished from each other.

To each corner of shelf No. 1, supporting the glass of water, four cords of the same color are attached, each cord passing through a screw eye directly above the point at which it is attached. The four white and four twisted cords can be followed in the figure from the corner to which they are attached, up through the screw eyes, across the frame, where one of each color passes through a screw eye over each corner of shelf No. 2 supporting the lead weight, and finally down to each corner of shelf No. 2, where they are attached.

If pressure be applied downward on the corner of shelf No. 1 where the four white cords are attached, the other ends of these cords being attached to the four corners of the shelf carrying the weights, the latter shelf will be raised and will at all times be level. Also, since the red, brown and twisted cords are carried in the same way from the other three corners of the first shelf to all corners of shelf No. 2, no part of either shelf can move up or down without all parts of the other shelf moving an equal distance in the opposite direction. Any part of either shelf will sustain loads equal to the full combined strength of the cords supporting that part.

The device is not limited to any one size or shape in securing these results. If the shelf is too long to carry the necessary load by the cords supporting it at the corners, a second group of cords can be attached to each shelf at any equal distance from the center of each shelf, carrying from each part of shelf No. 1 to each corresponding part of shelf No.



Lift No. 1: Plungers of Groups Nos. (1, 2, 3, 4) connected to plungers Nos. (1, 2, 3, 4) of Groups (A, B, C, D) of Lift No. 2, and conversely from Lift No. 2. Each plunger of Groups A, B, C, D, is connected to a similar plunger in Groups (1, 2, 3, 4) of Lift No. 1.

FIG. 5. DIAGRAM SHOWING CONNECTIONS FOR HARRIS BALANCED LIFTS

(Plungers of each group of one lift are hydraulically connected to the four corners of the other lift, so that the pressure due to one load is uniformly distributed to the other, making it impossible for either lift to get out of level.)

2 and duplicating the arrangement of the first set; these shelves can then be loaded to the combined strength of the 32 cords and at the same time be practically divided into three sections as to their strength for carrying these loads. Then, if force enough to overcome the combined friction of all the cords be applied to either shelf, all parts of each one will travel up or down the same distance at the same time.

It is apparent that with the two loads supported in this manner, either by plungers below the lifts, or overhead cables, no load, up to the limit of the design of the structure, could force either lift out of its normal plane or level, however eccentrically the load might be placed. If it were desired to build a pair of lifts several hundred feet long, the total length would be divided into a certain number of spans required by economy of design, and

the required number of similar systems of balancing plungers would be used and the various systems connected as shown in the sketch of a single system. Thus, by increasing the number of similar systems it would be possible to build lifts of practically unlimited size.

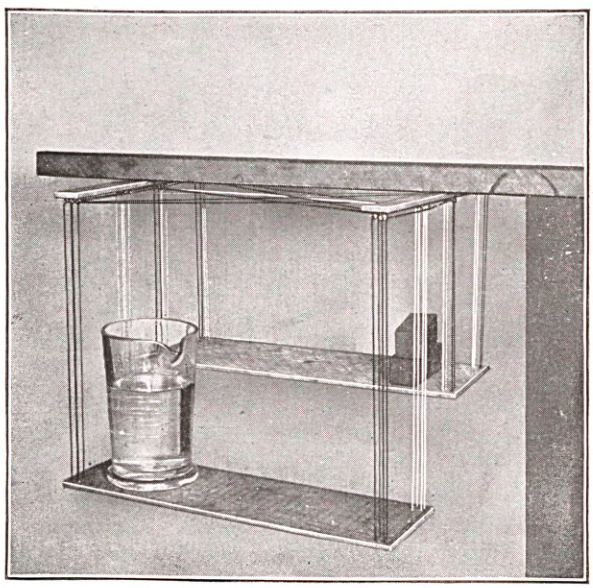


FIG. 6. SIMPLE MODEL OF HARRIS TYPE OF BALANCED CABLE-SUPPORTED LIFT

The utilization of the potential energy of one of two similar loads to shift them between different levels has only been applied in a large way to the transfer of vessels in canals. But the foregoing illustrated scheme of supporting two such loads makes it feasible to apply the principle to other uses. Clark's idea of transferring trains between different levels on single-plunger lifts may now be applied to the handling of freight between subway and surface levels, on lifts of sufficient size to carry any number of freight cars.

In view of the difficulty and expense of present methods of delivering freight, for example, into New York City by car ferry and the fact that no feasible method has hitherto been proposed for getting freight from subways to surface levels other than the hauling of trains up inclines or breaking freight below and lifting it on elevators of small capacity, this scheme is put forward as a solution to the problem of overcoming freight congestion.

With the increasing value of real estate, the use of large surface areas become prohibitive, making many floors above and below surface levels necessary. This scheme, applying balanced lifts to freight-terminal warehouses and points of distribution, would obviate present long hauls both by truck and train, and make it possible to utilize space to the greatest advantage. For the handling of freight it would be advisable to design the lifts so that a certain load could be lifted up in excess of that coming down. This could be done by having a certain number of lifting plungers under each lift, with a pumping plant of the necessary capacity to lift the excess load.

Fig. 7 shows a typical design of a freight lift for handling fifteen cars on each of two three-track bridge structures between subway and surface levels. After assuring the level and uniform travel of the lift by a certain number of balancing systems or plungers, certain plungers of the remaining groups have their pipe connections led through a pumping plant for controlling and lifting excess loads.

While it is true that in less-than-carload-lot freight terminals the outgoing tonnage is usually two or three times the incoming tonnage, this capacity for lifting a certain per cent excess load would be advisable and methods of handling such incoming and outgoing freight would have to be so co-ordinated as to make use of the loads in so far as possible. The available portion of the potential energy of the excess outgoing tonnage might be used to advantage to lift occasional excess incoming loads by storing the excess energy in accumulators and using it to assist in elevating incoming tonnage.

This principle may have a possible application in the field of shipbuilding in connection with the dry-docking and launching of vessels. For example, it might have been applied to advantage in the launching elevator recently built at the Ford plant for launching Eagle boats. In this installation two pairs of simple hydraulic jacks on each side of the platform are used to support the movable structure and boat and to lower the boat into the water. It is then necessary to pump the jack plungers and platform back up into position.

An elevator of this kind might be supported by groups of four plungers under each corner with a nearby counterweight to bal-

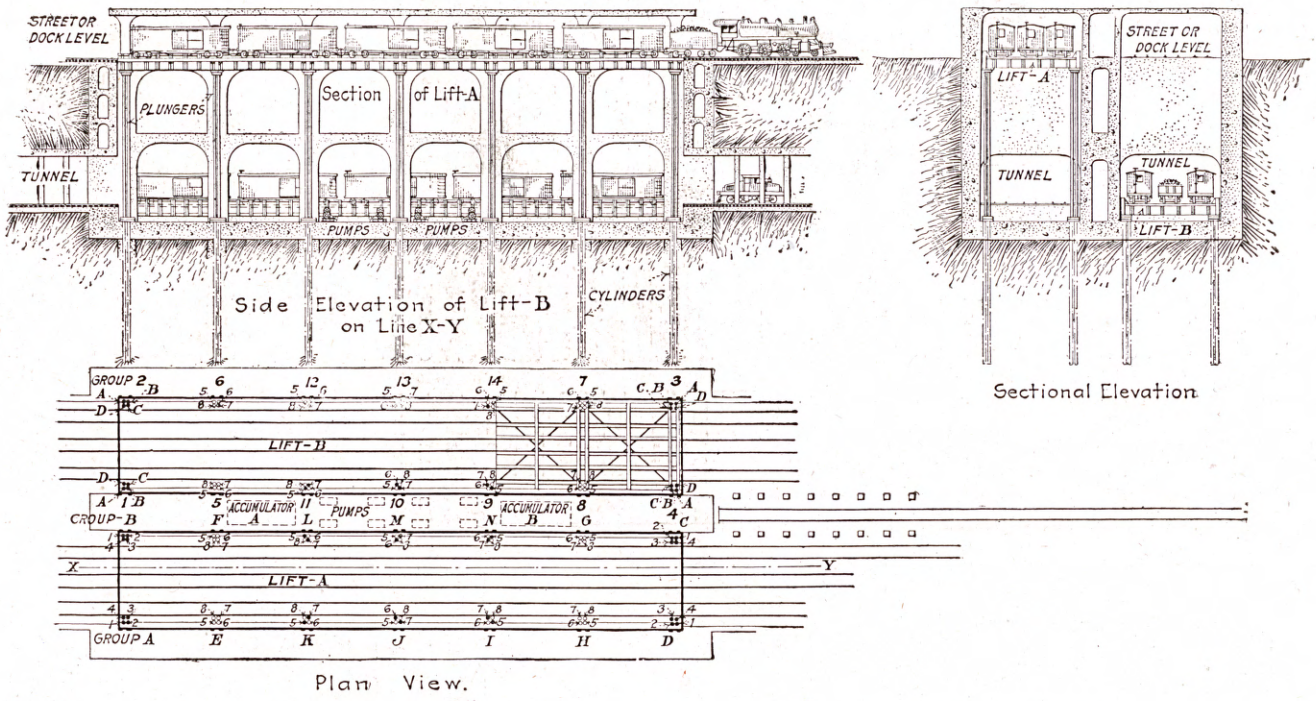


FIG. 7. TYPICAL DESIGN OF A HYDRAULIC BALANCED FREIGHT-CAR LIFT

ance the weight of the platform, supported on an equal number of plungers. With the plungers connected as described there would be no possibility of their tipping or binding, even though the platform were eccentrically loaded. The counterweight would bring the platform back up into position, without the necessity of a pumping plant or any power for control or operation.

This scheme may be applied to lift bridges where the span is too great for the use of the so-called "jack-knife" bridge. Here again the bridge structure could be supported by four plungers at each corner connected to four plungers under each corner of the counterweight situated under the roadway at one end of the bridge. The plungers under the counterweight might be two or three times the diameter of the plungers supporting the bridge, and so reduce the stroke of the counterweight to one-half or one-third that of the bridge.

The same principle of interconnecting the points of support of bridge and counterweight may be applied with supporting cables instead of plungers. It is probable, however, that the plunger lift would be the most economical design as no heavy overhead truss would be necessary and the towers now used in counterweighted vertical-lift bridges to support the overhead truss, counterweights and motors could be made very much lighter, since these towers would only be needed as guides at each end of the bridge. The movement of the bridge would be properly regulated by a train of throttling valves in the system of interconnecting pipe lines, and all operations would be governed by an inter-locking system of automatic control.

While the lift of 208 ft. in the proposed lock of the Erie and Ontario Canal project is considerably higher than any existing plunger lift, it is within the range of the feasible application of a multiple of supporting plungers. Such lifts as are proposed, supported on plungers, would be absolutely positive in their relative movement and would have their equilibrium and level assured without auxiliary apparatus. Plunger lifts would render unnecessary the immense counterweights, the total weight of which has to be equivalent to the weight of one lock with its water load. By supporting the loads on plungers below the structure, the retaining walls, which support the sheaves and total weight of the locks, could be made very much lighter as they would be needed simply to act as guides to the movable structure. With these locks supported on the proper number of systems of balancing plungers, as determined by economical design, the groups of four plungers at several points in their travel upward would pick up guides to act as stiffeners similar to those used with the long single plungers of passenger elevators. These guides would hang by chain or cable from the lock structure and would be provided with a loose collar for each plunger and guide in tracks in the side walls, thus breaking up the unsupported length of the plunger columns sufficiently to carry the load without bending.

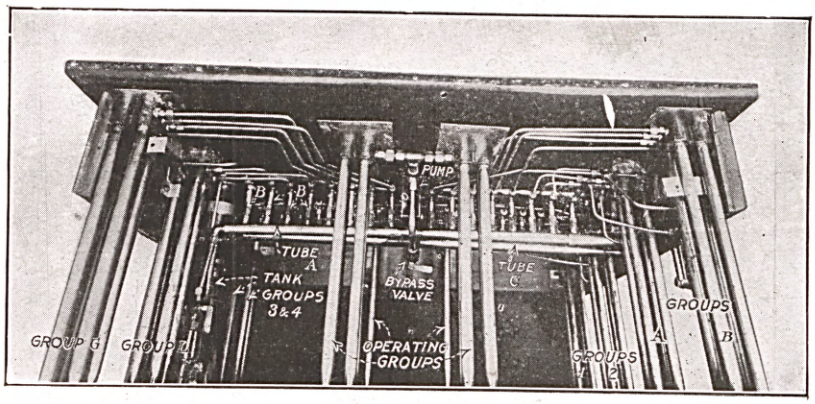


FIG. 8. VIEW UNDERNEATH MODEL NO. 3 OF HARRIS HYDRAULIC BALANCED LIFT, SHOWING PLUNGERS, PIPING CONNECTIONS, ETC.

In the cable-supported lifts described by Dr. Waddell it is proposed to use electric motors connected to the sheave-pulley shafts for shifting the locks. Since the friction of the extensive cable system and the inerita of two such loads, estimated to be approximately 50,000 tons each, would be very great, this would entail a considerable expenditure of power. In view of this fact it would seem more economical to make use of a surcharge

of water in the upper lock for shifting the locks, similar to the manner in which the Peterborough locks are operated. With the two loads supported on systems of balancing plungers, assuring perfect synchronism of movement, control in starting and stopping would be maintained by a train of simultaneously operated throttling valves in the various interconnecting pipe lines.

The proper sequence of events in the operation of such an installation, as a whole, would be governed by semi-automatic inter-locking control systems under the supervision of one man, so there would be little possibility of anything going wrong.

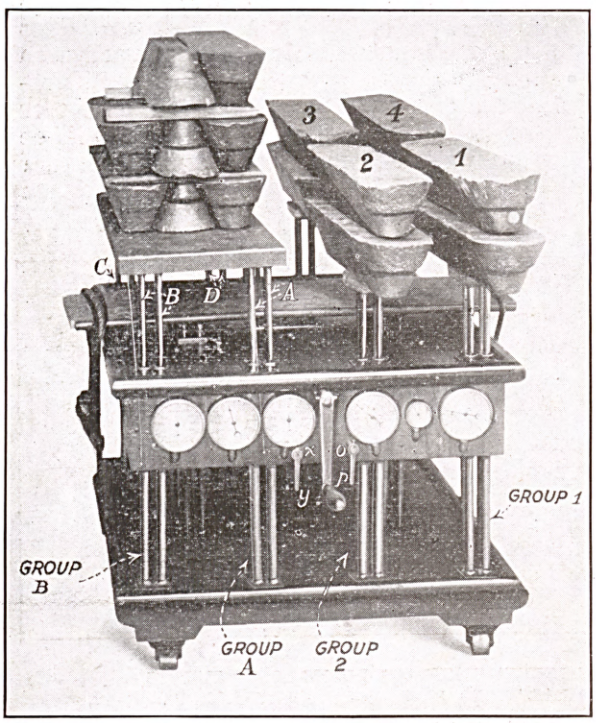


FIG. 9. MODEL NO. 3 WITH EACH GROUP OF PLUNGERS OF ONE LIFT HAVING INDIVIDUAL LOADS AND AN EQUAL LOAD ON THE PLATFORM OF THE OTHER LIFT

Figs. 8 and 9 illustrate the hydraulic-plunger application of this principle. Fig. 8, a view of the underneath side of Model No. 3 shows the four pipes running from the four balancing plungers at each corner of one platform to the four corners of the other platform. Under the middle of each platform are two groups of four pump plungers connected to a common pipe through a small geared pump to the other platform. At the left end of the model is a small accumulator, with a hand pump, which can feed through a common pipe and check valve in each of the 16 small pipe connections between the balancing plungers. The accumulator is kept under sufficient pressure to feed through any check valve to replace leakage in any part of the system. Another train of check and throttling valves—one in each of the 16 interconnecting pipe lines—connects to a common pipe and back to the accumulator for throttling down the platform that happens to be in the upper position when it is desired to put the lift out of commission for repairs.

In another view of Model No. 3 (Fig. 9) the pump plungers were secured down out of the way and a load of two pigs of lead was balanced over the cap of each set of balancing plungers. An equal load was placed on in this way it was possible to force down any one of the four groups of plungers by the pressure of the hand, when the other platform would rise and the remaining three groups of plungers would descend at the same rate; showing that no dependence was necessary on the platform structure for maintaining the level of the groups and that no strains would be produced in such a structure for maintaining the loads level. Moreover, when loads of 1200 lb. were placed eccentrically on each platform the lifts remained level when moved up or down by means of the pump and pump plungers.

The gages on the front of the model were installed for the purpose of studying the various pressures. The first one on the right shows the accumulator pressure; the small gage indicates the pump pressures, and the remaining four gages are installed in the pipe lines from the cylinders of one group of balancing plungers.

In its application to canal-lock lifts this principle has no limit to which it may be extended. It may be applied in the great canal systems being developed in Canada, and in the possible future canalization of the United States for ocean-going shipping. It has the very great advantage of economy of water necessary to supply the lockage of vessels. This feature makes it possible to build canals over territory where the rainfall over areas at summit level is insufficient to supply the water necessary for lockage in the old masonry type of lock. This matter of

taking the water supply now used for water power for use in proposed canal systems has alone been a considerable item of cost of proposed waterways.

While this scheme of interconnecting points of support of two loads, as described, has been granted basic patent rights and some little work has been done in the design and development of models and in anticipating the many engineering problems involved, no application of it has yet been undertaken.

It is believed, however, that by the development of this method of so connecting the points of support of two counterbalancing loads as to synchronize the movement of the supporting elements of the structure and make it impossible for the loads to get out of level ,its inventor, William Thomas Harris, of Chicago, has solved an important mechanical problem, and has opened a way to the future development of waterways and to more efficient methods of handling freight.

"The present tendency of modern power equipment, both steam and hydraulic, is toward the growth of large central power stations and interconnected distribution systems," is the belief of engineers of the General Electric Company.

This leads them to predict that these power stations will be situated at points of cheap coal supply or of hydroelectric development and will supply power for cities and industries over a wide section of country. The same systems will also furnish power for the railways in their territories. The Montana Power Company may be cited as an illustration. This company has 12 hydraulic power stations feeding into a common distribution system at 100,000 volts. The total installed capacity is approximately 175,000 kilowatts (235,000 horse power). Power is furnished to the Chicago, Milwaukee & St. Paul R. R. and for other purposes. The average 24 hour demand for the 440 miles of the C. M. & St. P. electrification is approximately 15,000 kilowatts (20,000 horse power.)

A recent issue of the General Electric Review describes a method of heat shrinking for fitting part of electrical machines on to their shafts. The method overcomes various difficulties experienced with press fittings. Water or steam heating is used for flywheels and couplings, while for armatures and field systems, conveniently situated heating resistances answer the requirements. In one case mentioned, i.e., a large armature, the shaft was 35 inches in diameter. Cold pressing would have required a maximum pressure of 600 tons. By heating the armature to about 80 degrees C., however, the shaft could be pulled in with a five-ton chain hoist.

The speed of submarine telegraphy is illustrated by the fact that five minutes are usually sufficient to cover a complete buying and selling operation between the London Stock Exchange and Wall Street. The distance between these two points is about 4,000 miles and it takes the message less than a minute for the journey.

It is stated that there are 715 electrical utility undertakings in Japan, including 625 power plants, 42 electric railways, and 48 companies operating both power plants and tramways. This is an increase of 40 companies over last year and evidences the growing popularity of electricity in that country.

Nearly one-third of the population of the United States belongs to the Red Cross. The adult and junior membership totals 31,000,000. Before the Red Cross organized on a war basis, it numbered less than 500,000 adult members.

AN UNTOLD STORY OF N. C. FLYING BOATS.

It is not generally known that the N. C. flying boats which not long ago accomplished the successful trans-Atlantic flight, were the first heavier-than-air machines in this country to be equipped with electric self-starters for each of their big Liberty engine motors.

The result of the Navy Department's decision to so equip its seaplanes undoubtedly aided the success of the enterprise, for the NC-3, lost in the sea and fog near the Azores, all her engines stalled, wet and cold, would never have been able to taxi into Ponta del Gada, under her own power without the assistance of mechanical means for starting her propellers.

This little device, the work of the Bijur Motor Appliance Company of Hoboken, N. J., consists of a small 12-volt electric motor operated by a storage battery connected through a geared reduction to a Bijur automatic screw drive. On the end of the screw shaft is cut an 8-tooth pinion which meshes with a larger gear on the propeller shaft. The starter will turn over the engine at 40 to 50 r.p.m. with a consumption of 100 to 110 amperes and a maximum of 1300 foot-pounds is available on the engine crank shaft, for breaking loose a cold engine. When the engine begins firing the screw drive automatically demeshes from the crank shaft gearing. The storage battery weighs 26 lbs. and has a rating of 24 ampere-hours—or sufficient to supply enough current to make 150 starts on one charging.

An interesting incident of the Amercan trans-Atlantic flight was that all three planes carried extra propellers, intending if one should break to descend to the water, change propellers, and start off again. They depended on the starter to make this possible.

It is also said that the C-5 (Blimp) met such strong headwinds on her trip from Montauk Point, Long Island, to New Foundland, that the force of the wind stopped her propellers, and it was necessary to ascend to a higher level to avoid them, the starter with which she was equipped starting the engines while in mid-air.

Aeronautical navigation has undoubtedly received a progressive impetus by the development of devices capable of turning over the engine while in flight.

In the days before aeronautical starters were developed—which is to look back scarcely two years—it took three men to start an airplane. One man turned over the propeller while two others, grasping him by his extended hand, stood ready to pull him away from the tremendous sucking power of the fast revolving blades.

Airplanes of the future will no longer be forced to glide to doubtful safety when engines stall high up above the clouds.

A new aircraft engine starter, which fits on the non-driving end of the engine has just been developed. It operates substantially the same as the propeller end starter (described above) except that the gearing is fully enclosed and the starter projects less than five inches from the crank case.

The starter is entirely disconnected from the engine except during the time of starting. The gears cannot be meshed while the engine is running and a safety device is provided which prevents damage in case of backfire.

This starter is being built to fit the Liberty, Curtis, Thomas-Morse, and other prominent makes of engines.

Twine engine dirigibles of the "C" and "D" classes, U. S. Navy, have adopted the Bijur starting system. The equipment has also been in use for some time on Blimps, using Hispano-Luiza engines and has more lately been applied to nacelles fitted with the "all-American" Union engine.

At a meeting of the Indianapolis Tech Club, Nov. 27, resolutions pertaining to the plans for the new school were passed. The Board of Managers met Saturday, Dec. 6, and considered these resolutions but decided to defer formal action until information now being sought becomes available.

The resolutions passed by the club follow:

RESOLVED, That it is the sense of the Indianapolis Rose Tech Club that the proposed buildings which are to house the Institute on the new campus should be built around such a plan and with such exterior and interior design as will provide adequate and ample working facilities for the school, in surroundings in keeping with the spirit and traditions of the Institute, and that this end should be sought within the limitations of the funds available without crippling the endowment resources of the Institute, which should be maintained to reinforce the Faculty and provide adequately for current expenses.

IT IS FURTHER RESOLVED, That it is the sense of the Indianapolis Rose Tech Club that the plans recently presented by the Architect for bids are not in keeping with the above Resolution and that therefore these plans should not be given further serious consideration, but that this problem should have additional study both as to arrangement and type of construction, such study to be carried forward by competitive design or otherwise as the wisdom of the Board of Managers may suggest.

BE IT FURTHER RESOLVED, That it is the sense of this Club that the welfare of the Institute demands that new buildings and equipment should be provided as expeditiously as the magnitude of the problem permits.

Mr. and Mrs. Fred W. Kingery of Louisville, Ky., will spend the Christmas holidays with their parents, Mr. and Mrs. H. W. Kingery of North Ninth street, and Dr. and Mrs. Clarence F. Williams of South Seventh street.

E. G. Waters, '88, visited Rose Dec. 6.

George Anderson, '16, was in Terre Haute last week.

Edward J. Dewey, '11, Capt. 41st Engineers, has received his discharge from the army and has resumed his position with the Fort Pitt Bridge Works of Pittsburgh.

The Rose Tech Clubs which were inactive during the war are catching their strides. The Indianapolis Tech Club held a meeting last week. The Cleveland Club will meet January tenth. The Terre Haute Club is planning an early meeting.

Ray Stephens, '09, has been appointed Assistant Division Engineer, Northern Division G. R. & I. Ry., effective October 1, 1919. Headquarters Grand Rapids, Mich.

Lieut. J. H. Becque has resigned his post as Commanding Officer of the U. S. Chemical Plant, Saltville, Virginia, and has been honorably discharged from the Army, to accept a Fellowship at Mellon Institute, University of Pittsburgh, Pittsburgh, Pa.

Albert F. Brennan, '13, has been appointed General Manager of the Walton Macke Nail Co. at Kokomo.

Edward G. Waters, '88, of Schenectady, recently spent several days at Terre Haute with his mother.

The following notes were to have been in the Nov. 26 issue but, due to a regretable mistake, were omitted:

Fred W. Hild, '17. is to be married to Miss Helen Leever. of this city. on Thanksgiving morning. Hild is with the Nela Lamp Division of the National Lamp Co., at Cleveland, Ohio.

G. L. Eshelman. '14, is with the Maxwell Motor Car Co. at Lawrenceville, Ill.

Robert B. Arnold, '03, of Roff and Arnold, is temporarily located at St. Louis with the Liggett & Myers Tobacco Co.

Milton Tilley, '17, was married Nov. 12 to Miss Grace Hartsook.

Albert H. Lyon, '17, who is with the Pennsylvania Lines at Cleveland, O., Spent Thanksgiving Day in Terre Haute.

Edward J. Hegarty, '15, and Miss Eunice McCune are to be married today. The wedding will take place in New York, where they are to make their home.

Chester E. Moore, '14, and Miss Rhea Miller were married November 19, at Arkansas City, Kan. They will make their home in that city.

The United States operates more electric locomotives over a greater electrified track mileage than all the other countries in the world combined according to figures compiled by W. B. Potter and S. T. Dodd, engineers of the General Electric Company.

"The approximate railway route mileage of the world is:

United States	265,218
Europe	217,000
Rest of the World	230,000

"The 265,000 miles in the United States represents about 400,000 miles of single track or a total mileage including trolley systems of approximately 450,000 miles. (This would represent a single railroad track stretched 18 times around the world).

"In considering heavy electrification," says Messrs. Potter and Dodd, "if we eliminate the electric roads which are devoted strictly to motor car service and include those tracks both steam road and trolley which are handling freight and passenger service with electric locomotives, we find in the United States approximately 675 electric locomotives operating over 4875 miles of route or 8300 miles of electrified track.

"Compared with this, in all the rest of the world there are about 450 electric locomotives operating over only 1000 miles of route or 1750 miles of track. That is, the percentage of electrified route mileage in the United States alone, is about ten times as much as the percentage in all other countries combined."

In order to present a figure showing the economy of electric operation, Potter and Dodd, taking the reports of revenue traffic for 1914, including the estimated tonnage of cars and locomotives, find that the railway traffic for that year amounted to 1,000,000,000,000 (one trillion) ton miles. Out of this, the movement of coal for railway purposes together with coal cars and locomotives carrying same, amounted to about 12%.

It is also stated that "the actual amount of fuel consumed by the steam roads in 1914 to move this tonnage (of one trillion ton miles), was 100,000,000 tons of coal and 40,000,000 barrels of oil, a total of 140,000,000 tons. They state that this same tonnage could have been moved with electric locomotives "by an expenditure of 40,000,000 tons of fuel—a saving of 100,000,000 tons a year."

And furthermore, that the annual electric power necessary would be 37,200,000,000 kilowatts. Continuing they say:

"Power stations capable of delivering this amount of power per year would have an aggregate installation capacity of 8,500,000 kw. The installed capacity of power stations in 1917 was approximately 20,000,000 kw.—a capacity over twice the requirements for operating all the steam railroads of this country."

ROSE LEAVES

BERGMANN

Fellow classmen were both surprised and pleased to learn that Mr. Harold Brown, a member of Prof. Fox's famous Gas and Flame division was presented with an eight pound boy last Thursday morning. As is the custom in celebrating such events, the class of '22 declared Saturday afternoon a legal holiday and cut all classes.

By a vote of the Faculty, the Christmas vacation is to begin Dec. 20, instead of Dec. 23, as had been the plan. The announcement of the change was received with all the solemnity due the occasion, and tho the student body offered considerable comment, no concerted action to having the ruling changed is expected of it.

To quote the handbook: "It is the custom of the Freshmen at Rose to wear green skull-caps during the whole of the freshman year." A number of Frosh evidently had not given these words of wisdom sufficient thought—they failed to appreciate that there is such a custom. At first the rule was well observed, but the number of foolish ones increased as the square of time in days, and it finally became necessary to discourage the practice of wearing unbecoming headgear.

It happened on the evening of December 2. On this fateful eve the upper classmen asserted themselves as the upholders of tradition. Armed to the teeth, they assembled to administer the chastisement due the backsliders. The scene of the first encounter was the machine shop. As the rainbow hued chapeaux appeared, their owners were upended while they learned the folly of their ways.

The scene shifted, finally, to the chem. lab. from which refuge many unfortunate victims were dragged. A few came willingly, but the willing ones were under the protection of the gorgeous green and red prescribed in the book of rules. Woe befell those who failed to show the brand of humbleness. A few tried to find safety by the back-window route but they failed miserably. Others tried gauntlet-running, but to no avail.

The method of proceedure was always the same. The victim came, he saw, he was conquered. A few cries of "watch them feet"; "turn him around"; the whack, whack, whack, of wood on flesh; the dying echo of footsteps as the unfortunate one went his painful way; and all was o'er.

When the main show had ended and the stragglers had all been accounted for, the upper classmen dispersed, feeling well satisfied with the day's work.

One of the most interesting trips of the year was taken by the Senior and Junior chemists on Saturday, December 13, when the Grasselli Chemical Company's plant was favored by the embryo stink artists. This plant, tho only one-fourth completed, is already one of the city's greatest industrial assets. It is built and operated with a view to the best interests of both company and employees. The buildings are of the best materials and design, and every feature shows that no expense was spared where the efficiency of the plant or the welfare of the workers was concerned.

The hospitality and courtesy accorded the visitors was by no means the least enjoyable feature of the trip.

R. O. T. C.

Last month the Lieut. Colonel assisting the Colonel in charge of the sixth district, paid an informal visit of inspection to our army, his call lasting several days. This pleasurable event was welcomed by all with the possible exception of the army and all considered the general state of affairs highly creditable except, perhaps, the Lieut. Colonel. He expressed the hope, however, that the under-classmen might be got into fit condition by spring, when the Chief himself is expected.

Actually, little fault was found; the companies were possibly a little ragged in looks due to lack of complete equipment and the work may not have shown up extra well as so little time is given this part of the course at the Institute. Most of the equipment for the Sophomores had come but little had arrived for the Freshmen. In the way of technical equipment, a number of sketching outfits have been received and more are expected. Also two or three each of transits and levels are expected to appear soon. These sketching outfits are very neat and complete for their purpose. The set consists of tripod, board with compass incased, rule, pace counter, pencils, paper, elevation finder, and a carrying case for compactly holding all of the above.

At present a study is being made of bridges. This is in preparation to the actual first-hand work to be undertaken next spring, for which the appropriate equipment will be provided. Slides have been shown recently of actual constructions made by U. S. army engineers, along the Rhein. Motion pictures and slides on the subject of Light Pontoons, are soon to be received.

Field work is carried on along with the classwork, as is the ordinary drilling. Pack and equipment instruction and tent pitching has been more or less absorbed by the upper class, with similar exposure imminent for the Freshmen. In the spring, by which time the latter are expected to have obtained the required equipment and knowledge, a three-day trip is planned. The army will have a chance to use its fine tinware and to learn how to wash dishes

The companies have received preliminary squad and company instruction and are now due to learn the mysteries of battalion evolutions. One afternoon each week has been given to formal guard mount.

The official list of cadet officers has recently been posted, although most of the men have filled these positions since the beginning of the term.

Major—Huston.

Captains—Goodman, Hunt, F. Owens.

1st Lieuts.—L. Wilson, D. Young, Dix, Dorsey, McDargh, Harris, Mewhinney.

Owens, adjutant to Major; McDargh, acting captain of second Freshman Company.

TECHNIC DANCE.

The business staff of The Technic were hosts for the second dance of the school year, at the Phoenix Club on the evening of December 5. Altho the dance was not a success financially, everybody had a good time.

The music was furnished by a four piece orchestra and the embryo Engineers indulged in the terpsichorean art till one o'clock.

This was the last Technic dance this semester but everybody is looking forward to the ones which will be given next term.

FRESHMAN RECEPTION.

The annual Freshman Reception held the 11th at the Y. W. C. A. was indeed a success.

The faculty and the students had an excellent chance to get acquainted and both bodies made the most of it.

After sufficient exercise had been taken in the field of song, all settled down to be entertained by a short program arranged by Bierbaum, '20. The first number was a piano duet given by Miss Helen Sumner and Mr. Bierbaum. Next came Prof. Childs, with vocal numbers.

We must say the crowning feature of the evening was the arrival of pop-corn balls, apples and sweet cider, via the pretty girl route.

ALPHA TAU OMEGA.

Fred Paige was host at a dinner for the active members of Alpha Tau Omega on Friday evening, Dec. 12. Following dinner the members were entertained at the Hippodrome.

W. H. Webster, '10, and Morton Hageman, ex-'12, were recent visitors at the Chapter House.

THETA XI NOTES.

Friday evening, Dec. 12, the Theta Xi Fraternity entertained with a dance at the chapter house. Prof. and Mrs. Wagner chaperoned the affair.

Messrs. "Dutch" Wente, '17, W. C. Woodling, '18, and J. A. Wagner, '18, were guests of the Chapter for the week-end. Mr. Wente is connected with Natl. Mall. Cstg. Co., Indianapolis. Mr. Woodling is with the Penn. Ry. Co. at Indianapolis. Mr. Wagner is with the Wagner Casting Co., Decatur, Ill.

ALPHA CHI SIGMA.

Iota Chapter of the Alpha Chi Sigma Fraternity held its regular monthly professional meeting at the chapter house in North Tenth Street last Friday evening. The close relationship of industrial chemistry to the daily life of the public was forcibly brought out. It was shown that there are two classes of industry from the chemist's viewpoint, that is, those that are dependent on a chemical reaction as a basis and those that are not. It was also shown that great progress is being made toward educating the public, so they will understand chemistry as well as they understand medicine now. Several elementary books have been written along this line and some of these were discussed briefly. The American Chemical Society's plan of publicity was also discussed. This society is spending twenty-five hundred dollars this year in the education of the layman's mind along chemical lines. This is being done by having the members of the society write short articles for publication in the newspapers.

Iota Chapter announces the pledging of D. C. Maxwell to the Alpha Chi Sigma Fraternity.

The members and pledges will be hosts for a dance on Monday evening, December 22nd. This will be a reunion for the alumni members and several have announced their intention of making plans to be here at that date.

ANCIENT MANUSCRIPT COMES TO LIGHT.

During excavation on the campus, preparatory to the daily repairing of the steam main, a very old document was unearthed, containing the supposedly first recorded account of the original sermon on a now well known subject.

While some expressions used may be unfamiliar to many, the substance should be clear to all. Credit is hereby given for the splendid work of Prof. Faurot and Mr. R. Harris in deciphering the hieroglyphics of the original, the exact wording of which has been preserved by them with one exception. Due no doubt to a then prevailing custom, all names were omitted by the ancient authors. The above mentioned translators, consequently, deemed it desirable to supply names. This they did with their characteristic originality, instead of offering the much too frequently used expressions such as John Doe, or Jack White. We wish our reader to bear in mind that these names are entirely fictitious, and we hope that the subject matter of the manuscript will be interesting and instructive to all.

(The Manuscript)

And it came to pass that the great Master did arise and depart unto the Abode of Learning, and, coming upon his followers assembled there, began to teach them, giving all manner of instructions unto them concerning those things whereof they were exceeding ignorant.

Now when he had been with them a little while one Dedert, the Dusty, did interrupt, crying out in a loud voice.

"O, Teacher, we beseech thee, tell us whence came thy new neck raiment of many colors?"

Hearing these words, the Master was seized with a great compassion for them on account of the lightness of their minds, and turning, spake gently.

"Verily, verily, I say unto ye; concentrate.

"For blessed are they that are diligent in all things whatsoever they attempt, for they shall become Seniors.

"And blessed are they that do renounce all manner of nightly pleasures for the Calculus, for they shall receive much wealth.

"For know ye not that an single hour, even as this, is worth an hundred shekels, if ye but be attentive?

"Therefore, take up thy pencils and follow me."

Then did he continue, and many there were that did hear, but few that did understand whereof he taught them.

Now after a time, there awoke one William, surnamed Junker. And it came to pass that, an hungered after evil, he arose and smote one of his brethern under the ear,

even with an wooden eraser. Then was there vast uproar, so much that verily was the Master distracted withal from the uttermost depths of thought.

And he turned and rubuked them, saying,

"O ye whose brains are as the chaff before the wind, repent, ye and concentrate, for the hour of the mid-term is near, from which no man escapeth.

"Wherefore tarry ye along the path of destruction, oh ye of little work?

"For verily, I say unto ye, except ye do concentrate, ye shall in no wise enter the class of the Junior."

And when he had spoken these words he began to reveal unto them the parable of the Equilateral Hyperbola. Now, presently, it came to pass that an uncouth saying entered the ear of a certain centurion, Hubert, called Goody, a very hard man, moreover exceeding presumptious, in as much as he had sought to sit amongst his elders in the Shrine of Chemistry, even in the Holy of Holies, the Sanctuary of the Journal Review. Now, merry with these unseemly words, he cried out with a great noise, so that was it like unto the braying of an ass.

And when they that were assembled heard these exceeding violent and offensive noises, great was the wrath of them all, yea, even unto the last one, and they cried out as with one voice, demanding,

"Thrust him forth! Thrust him forth!"

Now was the Great Teacher likewise an angered and commanded that this man be thrust forth and delivered unto the Governor that he might be banished forever from the Synagogue of Knowledge.

But when they perceived how great was the wrath of the Master, they relented and forgave their brother, and they took counsel among themselves how they might save him. Then arose he that was their spokesman, a certain Steffen, Priest of the Temple of Baur, and spake unto the Master, saying,

"Behold, O great Teacher, the face of this man, and look into his eyes; seest thou not therein repentence and humility? Wherefore forgive him we beseech thee, that he may receive the outpouring of thy wisdom and learning."

And the crowd shouted,

"Yea, let him remain, let him remain."

Then out of the greatness of his spirit did the Master relent and suffer him to remain. Nevertheless was he yet displeased and he admonished them, saying,

"Hearken unto me, ye hypocrites, for well do I know your thoughts;

"Verily, heed well my words, and be diligent with your problems, lest ye try my patience and ye be cast forth into outer darkness to return no more."

And when he saw that he was justified unto himself with these words, he took up the chalk and expounded unto them an sample examination, revealing unto them the extent of the mid-term.

Then it came to pass that great was their concentration in those things whereof he spoke.

MILLIKEN-ROSE.

The Engineers journeyed to Decatur on Thanksgiving Day, and were defeated by the fast Milliken University team by the score of 26 to 0. Rose faced the Illinois team with a crippled line-up, but played a remarkable game despite the handicap. The "Suckers" were held scoreless until the latter part of the first quarter. There was no scoring done in the second quarter but Coach N. G. Wann's horde crossed the Rose and White goal line once in the third quarter and twice in the final period.

Dix was the most dependable Rose man on the offensive while Kremer played a great game on the defensive. Although the Milliken men had a great team it is the belief of some of the Rose team that they could have won if all the regulars had been in the game.

By merely comparing the scores of the games played by Rose this year one would say that the Engineers had a very unsuccessful season, but on the other hand if every game were carefully gone over and analyzed, it would be readily seen that old Rose was represented by an exceptionally good team.

When the season first started, Coach Gilbert was very busy trying to find a quarterback. Captain Brophy, who has been playing in the back field for three years was tried at the position and he rapidly developed into a field general of no little ability, and he led the team in fine style during the entire season. The center position also seemed to be a difficult place to fill, but Briggs stepped in at the pivot, and proved to be one of the strong men in the line. Much credit is due Briggs for his good work. The rest of the line was also unusually strong. Harris and Standau, two freshmen, were towers of strength in the Rose line. Steffen, Gray, King and Krausbeck were all linesmen of good caliber.

The back field showed great smashing ability, and the opponent's line was often pierced by these speedy individuals. Dix, at full back, was one of the bright lights in the back field. His speed and ability to gain ground consistently was a revelation to the Rose fans. Joe Engelhard showed wonderful ability in piercing the opponent's line for material gains. Nouss was another big factor, as was Jake Reinking. Taggart showed up in the back field to a great advantage, especially in the Alumni game.

The Engineers had an unusually good pair of ends, in Moses, and Self. These men guarded the wing positions in great style, and were fast, aggressive players. Kremer played sub end, and was given the chance of his life in the Milliken game. Kremer had played on the varsity squad for four years, but failed to land a regular berth due to the fact that he was exceedingly light. Kremer deserves a lot of credit for his persistence in trying to overcome his handicap. How well he succeeded was shown by his playing in the last game of his school life. Coach Wann of Milliken made the statement that Kremer was the best end that has opposed Milliken this year.

Joe Engelhard, '21, was elected to lead the 1920 football team. Engelhard is a worthy man for the captaincy. Joe has played a stellar game all season, and the example he has set for his followers is a good one.

The season's scores:

Oct. 4, Alumni 0; Rose 0.

Oct. 11, Eastern Illinois State Normal 0; Rose 25.

Oct. 18, Franklin 14; Rose 7

Oct. 25, Butler 7, Rose 21.

Oct. 31, Wabash 10; Rose 0.

Nov. 8, St. Xavier 6; Rose 2.

Nov. 22, Hanover 6, Rose 21.

Nov. 27, Milliken University 26; Rose 0.

INTER-CLASS BASKET BALL.

The series was as well played and as hard fought as any inter-class series we have ever had. Most of the games required extra time to give a verdict, and with few exceptions the scores were close.

The Freshmen came out on top, with the Seniors and Sophs tied for second place. The deciding game, Seniors vs. Frosh, opened with the betting about even. It was soon evident that the Frosh had the upper classmen shaded when it came to hitting the basket and it was due to this that the Frosh came out on the long end of the 15 to 10 score.

At the time of going to press the Seniors and Sophs have still to settle the question of who's who in second place, and the Seniors are then to clash with the Freshman second team. According to the dope, the Seniors should win both these encounters.

Prospects for a good basketball season are looming up brightly. The inter-class games started things off with a rush and as a result there are at least 25 thin-clad candidates out.

Jake Reinking is captain of the basketball quintet this year, and things should hum under his guidance.

With the men left in school from last year's squad, and the new men in the freshman class, Coach Gilbert will, without a doubt, round up a team which will make our rivals hustle. In the first year class there are a number of former high school stars, and they have already shown their ability in the inter-class series. Jim Conover, Ray Harris, and Al Standau, former high school stars, have shown that they have ability to land a position on the quintet. Ellis is another freshman who will probably show up well in a Rose uniform. Dix, Brown, Hermeling, and Lentz are all good basketball men.

In the sophomore class there will be Conover, Henderson and Reinhard to consider in the race for varsity positions. Conover and Reinhard played in a majority of the varsity games last year. The Juniors have the following men to represent them in the race for positions; Walker, Krausbeck, Moses, Biller, Wier, and Hunt. Walker, Krausbeck, and Biller have had varsity experience. In the senior class there are the following men out for the varsity: Briggs, Rolshausen, Froeb, Pence and Captain Reinking.

It is possible that there will be a five game series with Normal this year, instead of a three game series as heretofore.

The basketball schedule:

Jan. 1—Y. M. C. A. at Evansville.
Jan. 3—Butler at Indianapolis.
Jan. 9—Earlham at Richmond.
Jan. 17—Wabash at Terre Haute.
Jan. 24—State Normal.
Jan. 31—Earlham at Terre Haute.
Feb. 7—Franklin at Franklin.
Feb. 11—State Normal.
Feb. 17—Wabash at Crawfordsville.
Feb. 28—State Normal.

Other games are pending with Butler, St. Louis U., Indiana Dentals, Michigan Aggies, Indiana, Kalamazoo Normal and Valparaiso U.

THE GOBOON

VOL. I No. 5

We reprint, herewith, evidence of the furore at the Indiana State Normal School caused by a recent article in the Goboon. The editors wish to apologize to the students of that institution. They realize now, that the article was a trifle too hard on Normal. We should have stopped to consider that the truth is sometimes hard to bear.

The Technic derives must satisfaction from the acknowledgement by "America's Best and Livest Normal School Weekly—the Advance," that the Technic is modest. This from "Stag Stuff":

"The Rose Tech Goboon in an editorial declares that Normal credits are 'soft', and that all the co-eds have to do is to knit and learn how to make milk toast.

"Of course they know better over there at Rose Poly, but we've walloped 'em so hard in athletics during the past four years that they must feel spiteful. Anyway, what can you expect from a 'Goboon?' "

And this from "Co-Ed News":

"Rose Poly men are getting very gallant —for them. They fear that the presence of a few men might disturb our co-eds. That is all right. Turn about is fair play, you know—we soak Rose to a finish in basketball, and there is no other way they can soak us except in their modest little news sheet."

H. Clarence Schlaman, the shrinking violet of the Senior chemists, was recently offered a tempting position with the high schools of Vermillion. Young Schlaman, who has had a year's experience in this line, was tendered a place in the course of applied psychology. As a sideline, however, he would teach commercial geography, typewriting, spelling, physiology, domestic science ancient history, medicine, law and art. Mr. Schlaman, however, refused the offer as he has just contracted to be Theda Bara's leading man in "The Filthy Thing."

Frederick A. Paige of the Sophomore class was recently arrested by patrolman Flynn at Thirteenth and the Big Four. Young Paige, at the time, was busily engaged in pushing a car load of coal up the tracks, and when questioned by officer Flynn could give no good account of his actions. Upon inquiry, it was learned that he had stolen the coal in the neighborhood of Clinton and was pushing it to the Rose Polytechnic Institute at which he is a student. When examined at the station house, Paige admitted he stole the coal but the college would be forced to close unless it obtained more fuel, he said, so to prevent this he had undertaken to procure some. Upon hearing his excuse, a profound apology was tendered the young man.

A deplorable disorder took place upon the night of December 10, in the higher regions of the Grand. The participants were both Rose students and it is certain their misconduct reflects discredit upon the reputation of the Institute. The offenders were Zachary Xylophone Bennett and Stewart Courtright Stimson. Bennett and Stimson were attending "Three Weeks," as required by the English department, and it seems Bennett had provided himself with opera glasses. At Stewart's request, he obtained the loan of the glasses, when suddenly the "Bathing Girls" rushed upon the scene. In his excitement, Zach grabbed for his gallilean telescope, striking Stimson a smarting blow in the eye, thus infuriating him. After quite a tussel the two combatants were taken in charge and ejected from the theatre.

Altho it is a fact not generally known, one of our fellow students is a member of the royalty of Spain. In the fall of 1917, a dark lad of nineteen summers was registered among the freshmen. This boy, while unassumingly posing as Gilbert Epps, was none

other than Guilbert Alphonse Nicholas Eppesie. Recently upon the death of his uncle, the late Lemuel Orion Eppesie, Guilbert became aware of his accession to the title of Duc d'Castoria, one of the most powerful dukedoms in all Spain.

When interviewed at his luxurious apartments the duc' received us graciously and quite eagerly answered all questions. When asked if he intended to remain at Rose his sable mustasche quivered with passion before he replied, "I intend to remain until I obtain my degree. It is my intention to take up my residence at the old ancestral home on the River Omelet immediately after my graduation."

This old castle is one of the most famous in Spain. The wine cellars are said to run for miles and they are known to hold two thousand five hundred nine quarts of extra dry Peruna placed there in 1310 by William T-'ell. As can be easily seen such an inheritance is priceless. Guilbert is indeed a fortunate youth.

Glen Maxwell wishes to announce he has become a Knight of the Garter. "Tubby" has chosen to rise by the "Paris" rite, altho he hopes to take the "Boston" degree at an early date. Maxwell is well acquainted with all the secret work such as the "Velvet" grip. He has also announced his intention of once more renewing his affiliation with the "Order of the Bath" as soon as the pipes thaw.

The Glee Club met recently, there being for the first time this year a full attendance. Both of the members stated they were feeling fine.

"Professor," called the timid Frosh,
As loudly as he dared,
"How can a circle's area,
Ever equal pi R squared?"

Professor Child was so polite,
He always raised his hat,
Each time he passed, upon the street,
A female dog or cat.

DIFFERENTIALS

She—"Look at that funny French name on the menu. Do you know what it means?"

He (looking at price)—"It means a glass of water for me if you take it."

"Did you get anything?" whispered the burglar on guard to the other as he came from the house.

"Naw, de guy in dere is a lawyer."

"Hard luck," said the first, "did you lose anything?"

"When she wasn't looking, I kissed her."

"What did she do?"

"Refused to look at me for the rest of the evening."

"Did your watch stop when you dropped it on the floor, Doc?"

"Sure, did you think it would go on through?"

"I like your cheek," he said, kissing her.

"Don't get facetious," she replied coldly.

Friend—"I understand your practice is getting larger."

Doc—"Oh! yes, my patient gained ten pounds last month."

Little Brother—"Bet he'd kiss you if I weren't here."

Sister—"You insolent boy! Go away this very minute."—Penn State Froth.

"Is your house insured against fire?"

"Don't know! Just got through reading the policy."

Ron Manson—"Shall we talk or dance?"

His Girl—"I'm very tired. Let's dance."

She—"Am I the first girl you ever kissed?"

He—"Why-er-I don't know. Your face seems familiar."

Bill—"Do you believe in signs?"

Kate—"Yes, indeed."

Bill—"Well, last night I dreamed you were madly in love with me. What is that a sign of?"

Kate—"That's a sign you were dreaming."—Life.

Mrs.—"I was outspoken on my views at the club today."

Mr.—"Don't believe it. Who outspoke you?"

St. Peter—"What was your occupation on earth?"

Spirit—"Robber."

St. Peter—"Ice, coal, or sugar?"—Life.

HIS ONLY CHANCE.

"Why do you carry the umbrella, little boy? The sun is not shining and it's not raining?"

"I know it, but when it rains papa wants it, and when the sun shines mom wants it, and this is the only kinda weather I get to use it at all."—Life.

"What kind of a guy is Johnson?"

"Well, if you see two fellows on a corner, and one of them looks bored, the other is Johnson."

Wife—"I'm afraid, Jack, you don't love me any more."

Hubby—"Why?"

Wife—"Because you always let me get up to light the fire now."

Hubby—"Nonsense, my love. That makes me love you all the more."—Life.

Mrs.—"Such a charming husband Mrs. Jones has! So tender after ten years of marriage."

Mr.—"Quite natural! It would make a rhinoceros tender to be kept in hot water for ten years."—Life.

"Is she really musical?"
"A genuine artist. You should hear her refrain from singing."

"You certainly have a trim little waist," said he, admiringly.
"You're right," she replied, icily, "there's no getting around that."

"Woman," shouted the villain, "the crime is on your head."
"Is it on straight," anxiously demanded the villainess.

CORRECT.

Major Premise—I'm not the head of an ass.
Minor Premise—I'm not the tail of an ass.
Conclusion—I must be no end of an ass.—Yale Record.

IN 1930.

Dix—"What are you doing now?"
Bix—"I'm making a house to house canvass to ascertain why people are not buying a certain patent clothes wringer."

He—"You refuse me then. Oh! well, there are others."
She—"I know there are. I accepted one of them this afternoon."—Boston Transcript.

"I met Dunkey today for the first time in years. He hasn't changed a bit."
"Oh, he hasn't changed, but he doesn't seem to realize it."
"How so?"
"He's always talking about what a fool he used to be."—Red Hen.

"Hey, Briggs, what's your idea of a hyprocite?"
"A guy who goes in to a Power Transmission lecture with a smile on his face."

"When are you going to pay me that dollar?"
"How's that."
"I say, it's time you paid me that dollar."
"Can't hear a word ye say."
"Wait a minute and I'll write it down."
"Tain't no use. Can't see without my specs."

Watson caught "Papa" Brown calling "Daddy" down the shop well the other day and anxiously listening for the echo.

"'Fessor" in Applied Calculus the other day was reading Y sub-zero from the board. Dowen heard him yellow "Y naught," and thought he was talking to him and so answered, "I don't know why not?"

Jo-Jo evidently thinks much faster than he talks or writes. "If you cool this gas off, does its temperature go up or down?"

THE OLD EGO.

"There are several girls around here who intend never to marry."
"How do you know?"
"I have proposed to several."

"Pat, there's only one thing that will kill the flu—that's whiskey and quinine."
"Where can you get it?"
"The whiskey and quinine?"
"No; the flu."

"John, you yawned twice while we were calling on that lady."
"Well, dear, you did not expect me to keep my mouth shut all the time, did you?"—Life.

"Yes," said the concientious dealer. "This hammock will hold two, but it will be a tight squeeze."
"Oh, that will be all right," said the maiden, blushing, "just send it around to the house, please."—Life.

Bierbaum (at Freshmen Reception)—"Mr. Steffen will again sing, 'I Cannot Tell You Why.'"

Jo-Jo—"What is velocity, Owen."
Owen—"Velocity is what most of the boys use when the professor is not there at ten minutes after the hour."

"That man is looking straight at my nose."
"Most likely a reporter."
"And why should a reporter stare at my nose?"
"They're supposed to keep their eye on everything that turns up, aren't they?"—Boston Transcript.

"What are you going to put in the paper this month, Zim?"

"About forty articles concerning what we had last month."

"Yes."

"And about ten more concerning month before last."

"What else."

"Well, that ought to be enough for this month."

She—"I consider, John, that sheep are the the stupidest creatures living."

He—"Yes, my lamb."—Life.

"Doctor in?" asked the caller.

"Yes, sir," replied the maid.

"Can I see him?"

"I'm afraid not. He's upstairs in his room, shaving."

"Oh! very well. Take this bill he sent me up to him and see if he can shave that a little."

LISTEN WELL.

Casey (to MacDargh)—"Boy, you sure have got some ears."

McDargh—"Tut, tut, boy! Those are engineers."

Senior Farmer (to Knipy)—"Say, 'Fessor, what direction does this alternating current flow in?"

Kremer (at piano)—"They say you love good music."

She—"Oh! that doesn't matter, go on."

The Man at the Door—"Madame, I'm the piano tuner."

Lady—"I didn't send for a piano tuner."

Man—"I know it, lady; the neighbors did."—Chicago News.

"How you getting along in the law business, old man."

"I have one client."

"Is he rich?"

"He was."—Transcript.

"Very suspicious man, they say."

"Very. Bought a dictionary the other day, and now he's counting the words to see if it contains as many words as the publishers claim."—San. Fran. Chronicle.

"A sixteen page letter from 'Stew' Stimpson; what does he say?"

"He just asked me how I was getting along."

First He—"Let's go up to Tokio for awhile."

Second He—"No, I don't believe I care to dance."

F. H.—"Aw, come on, get a new hat for your old one, anyway."

"The Widow Smith's husband didn't leave her very much when he died, did he?"

"No; but he left her a lot before he died."—Life.